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ABSTRACT

This study examined the effectiveness of problem-based learning (PBL) in a foundational teacher education course at Alabama's Samford University. It measured students' attitudes within the university and in the teacher education course. All undergraduate students were asked to complete a "Student Attitude and Activities Assessment Survey" at the beginning and end of the fall semester. At the end of the semester, the second instrument they completed added five questions to the end of course evaluations. The instruments were designed to examine changes in students' attitudes during the semester and differences between students in courses with PBL strategies and in traditional courses. Results indicated that there were few significant differences between responses from students in PBL courses and from students in non-PBL courses. Students in the foundations course noted difficulties with using PBL strategies effectively in large classes. The faculty found the course frustrating yet invigorating because PBL strategies challenged students' thinking and problem-solving skills. Overall, the results showed that PBL could be used effectively with a large class of undergraduates to make information come alive and have meaning beyond the textbook. (Contains 15 references.) (SM)

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Problem-Based Learning in Teacher Education

Paper Presented at

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Problem-Based Learning in Teacher Education

Abstract

Problem-based learning is an important teaching strategy to prepare educated persons with not only a high level of knowledge but also the ability to think critically and solve problems. This paper discusses the implementation of problem-based learning in a foundational teacher education course. Goals for the use of PBL are discussed along with outcomes. Recommendations based on quantitative data, students' comments and professor's observations prompted changes in spring semester. Outcomes of the revised course indicated that PBL can be used successfully with undergraduate pre-service students to begin to develop an understanding of and a positive attitude toward active learning strategies.

Problem-Based Learning in Teacher Education

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The questions of *what* and *how* to teach have been debated for centuries, but at no time has there been a general agreement on the answers. At the close of the 20th century, Americans are once again focusing on the country's educational institutions as a national priority. With rising concerns over educational effectiveness and the recognition of an unprecedented knowledge explosion, many educators now believe the main purpose of education is to foster critical thinking, problem-solving, and decision-making skills (Boyer, 1995; Cummings, 1989; Penick, 1989; Relan & Kimpston, 1991).

Many educators are proposing curricular restructuring and the inclusion of problem-based learning strategies to develop these skills and to make education more meaningful to students. In order to move to this new type of curricula at whatever level—graduate, undergraduate, or K-12—teachers must be prepared to implement new models of instruction. To accomplish this task in K-12, it is the responsibility of teacher preparation programs to prepare entering teachers with a new curricular focus, one that holds relevance to students and fosters problem-solving and decision-making skills (Cohen, 1978; Goodlad, 1984; Relan & Kimpston). This change calls for major reforms in teacher education programs (Edmundson, 1990; Goodlad, 1984; Sarason, 1993).

If innovations in education are to take place, different teaching strategies must be emphasized, and teacher preparation institutions must lead the way. This paper presents a qualitative study of problem-based learning (PBL) in a teacher education course at Samford University. The purpose of the study was to determine whether PBL strategies

could be used effectively to improve undergraduate learning and to provide a model for prospective teachers for the use of problem-based learning in the classroom.

This paper examines the rationale for using PBL in a teacher education program. It explains the PBL project at Samford University and explores the use of PBL in a teacher education class. Results of the fall class are documented and recommendations made. Many of the recommendations were implemented into the course in spring semester. Course structure of spring semester and findings are discussed.

Rationale for the use of Problem-Based Learning in the Classroom

The debate about what and how to teach began at the height of the Greek civilization and has continued into the 20th century. Most of the 20th century was dominated by two major learning theories, both of which were outgrowths of psychology: behaviorism and cognitive learning theory. Although behaviorism dominated education for most of the 20th century, an understanding of cognitive psychology began to have a significant impact on the educational community. More and more educators have come to understand that "the whole is more than the sum of its parts" (Hergenhahn, 1982, p. 245).

Research conducted in the latter half of the 20th century has provided new understandings about how humans learn. Research on the brain conducted during recent decades confirms the view that learning is holistic and, therefore, supports the need for more integrated learning (Sylwester, 1995; Caine & Caine, 1995; Lowery, 1991). Based on this research, a growing number of educators acknowledge the need for learners to interact with their environment, believe learning should be holistic and integrated, and value problem-solving and higher order thinking skills as primary outcomes of learning.

A variety of studies and reports from leading professional organizations have demonstrated an unusual level of agreement about learning outcomes and educational standards (McTighe & Schollenberger, 1991). The studies call for an increased emphasis on thinking rather than the accumulation of facts.

Reports from the National Assessment of Educational Progress (NAEP) indicate that, although there is evidence of progress in student achievement in the areas of reading, math, and writing, these gains are primarily at the lower levels of achievement. NAEP suggests that "the educational system in this country needs to extend its focus from the teaching and learning of skills and content to include an emphasis on the purposeful use of skills and knowledge" (Applebee, Langer, & Mullis, 1991).

Leading professional organizations have demonstrated their commitment to fostering problem-solving and higher order thinking skills as a priority for the future. The national councils of mathematics, English, science and social studies and the Association for Supervision and Curriculum Development include these skills in their recommendations for professional standards (McTighe & Schollenberger, 1991).

Business and government leaders have also stressed the need for education to emphasize a higher level of thinking and of skills. Wilson (1991) reported on a 3-year collaborative project to develop a curriculum to meet the needs of learners for the 21st century. This project, based on a Delphi study of approximately 150 national business, government, and educational leaders, assessed trends and made recommendations for appropriate curriculum restructuring and design. This group of leaders was united in a call for high school and college graduates who are prepared for an ever-changing future,

lifelong learners who have the ability to access information and assimilate it to solve problems.

Schools have not traditionally emphasized this higher level of thinking. In the report of one of the most extensive studies ever conducted of American schools, Goodlad (1984) expressed disappointment in the lack of hands-on and active learning found in the schools in his research. In spite of district goals that often include thinking and problem-solving skills, Goodlad found a predominance of lecturing, questioning, monitoring, seatwork, and testing that focused on the lowest levels of learning.

Goodlad (1984) posed the question, "What do Americans want from their schools?" (p. 244). He stated that educators who believe that learning should go beyond recalling facts and computation must restructure education, since "No longer will it be sufficient to teach some facts of geography, a little algebra, or the mechanics of language. The school will become a means for learning that will transcend them" (p. 244). In other words, schools must transform their roles from being imparters of information to that of knowledge constructors.

Problem-Based Learning in Teacher Education

As the need for a focus on higher order thinking and decision-making skills becomes more widely accepted, the question emerges of how to implement these skills in the classroom. It is clear that teachers must assume enormous responsibility, but "are teachers equipped to implement integrated problem-solving approaches?" (Relan & Kimpston, 1991). Penick (1989) agreed that it is the teacher who must be prepared to structure a problem-based approach. He pointed out, however, that teachers most often

teach the way they have been taught, and very few teachers have experienced problem-based learning in the classroom.

Goodlad (1984) postulated that a primary reason for the failure of education reform in the 1950s and 1960s was "that the movement never became linked to the structures and institutions preparing and certifying teachers" (p.293). Teachers entering the classroom were not prepared to implement an innovative curriculum.

It is clear that teacher education institutions must assume the primary responsibility for preparing their graduates for new ways of teaching. If teachers are to take into the classroom strategies for developing critical thinking and problem solving skills, they must have examples from which to model. Teacher preparation programs must emphasize strategies such as problem-based learning. Redesigning teacher education curricula to support PBL is difficult but critical to the ultimate task of preparing students at all levels for the next century. Indeed, teacher educators must recognize that

> Improving the preparation of teachers requires reconstructing the curriculum of teacher education. ...The enterprise must be redesigned...to be congruent with a clear and expanded conception of what it means to be a teacher....The skills and habits of reflection should be deliberately taught, consistently applied. Students should receive assistance in learning to tolerate ambiguity and seeing the greater benefits of knowing how to solve problems rather than knowing a finite number of solutions to specific problems (Edmundson, 1990, p. 722).

Problem-Based Learning at Samford University

Believing that teachers entering the classroom must be prepared to encourage higher-order thinking and problem-solving skills, the School of Education at Samford University along with members and programs of the broader university community began in 1995 to investigate problem-based learning. Over the past three years, faculty have visited other universities implementing PBL, attended workshops, invited experts to campus, read the literature, and held numerous faculty dialogue groups. Through this process, the faculty has implemented PBL strategies in a variety of courses throughout the curriculum. In 1998, the university was awarded a sizeable grant from the Pew Charitable Trusts to explore PBL in undergraduate education. Sixteen courses in five schools across the university were redesigned in a PBL model, with 33 more planned for fall 1999. As a part of this university-wide initiative, Foundations of Education was redesigned from a traditional lecture-based to a completely PBL format.

Purpose of the Study

The purpose of the study of this teacher education course was to explore problem-based learning in an undergraduate course and to help determine ways to effectively use PBL strategies with traditional undergraduate university students. The following questions will be explored:

1. *As a part of the university-wide initiative, how can PBL be used effectively in undergraduate education?*

   PBL has been used for a number of years and continues to grow in popularity in medical and engineering schools. These schools enjoy selective enrollments of highly motivated students. Problems for these programs can easily replicate real life.

The unanswered question is how effective will these strategies be with traditional undergraduate students.

2. *Can PBL be effective in a course with a large enrollment?*

   Problem-based learning has been most effective in medical and engineering schools with small groups of students and tutors working with each group. In large classes without tutors for the groups will sufficient learning take place?

3. *How can the material in an introductory course be made more relevant to students just beginning their education program?*

   Students entering an education program most often do not see the relevance of studying philosophies, learning theories, historical aspects, and even the current issues. At this level, students will often say, "Just tell me how to teach." They want a "cookbook" approach with recipes for creating success in the classroom. This course should explore ways to help students think about the complexity of the teaching and learning processes, including varied theories on how to encourage and facilitate learning and the social and political issues that surround the teaching profession.

4. *How can future teachers become more comfortable with PBL?*

   Higher-order thinking and problem solving skills must be a priority for classrooms of the next century. In order for these skills to be prominent in K-12 education, teachers must be comfortable and proficient with strategies that promote this kind of learning.

Methodology

A qualitative research methodology was used to study the effectiveness of PBL broadly at Samford and, specifically, in this teacher education course. Instruments were

used to measure students' attitudes at the university level and in the specific teacher education course. The university wide measures included two survey instruments. One instrument, a Student Attitudes and Activities Assessment Survey, was administered in all undergraduate courses at the beginning and the end of fall semester 1998. The second instrument, five questions added to the end of course evaluations, was administered in all courses at the end of that semester. Both instruments were developed by a faculty team at Samford with questions based on expectations noted in the literature about PBL. The objective of both instruments was to determine if changes occurred in student attitudes during the semester and to see if there were significant differences between students in courses with PBL strategies and those in traditional courses.

The Student Attitudes and Activities Assessment Survey asked students to respond to 52 statements using a scale 1 (strongly disagree) – 5 (strongly agree). Following are a few sample statements:

I feel comfortable working and participating in small groups.

I am willing to persevere and persist at finding solutions to problems.

I value different points of view.

I am confident in my ability to identify and search for information that is needed to solve a problem.

In the Foundations of Education course, additional data were drawn from responses to questions in students' journals, comments on the course evaluations, and comments in student focus groups. Students were asked to reflect on their learning from each problem encountered, the cohesiveness of their group, resources used, and overall reflections on

the course, including suggestions for improvement. Conclusions were also drawn from entries in the professor's journal.

Structure of Foundations of Education

Foundations of Education is required for all education majors prior to being admitted to the teacher education program. The majority of students take the course in their sophomore year; however, the enrollment includes some freshmen, juniors, and a few senior-level students, who have decided to change their majors to education. Students are primarily 18 to 19 years old; 80 percent female, 20 percent male; 95 to 96 percent white; 4 to 5 percent African American.

The course is blocked with EDUC 220 (Introduction to Education) in the time slot of 8:00 – 10:20 a.m. Monday, Wednesday, Friday. EDUC 220 is an experiential course that places students in a classroom in an inner city school for the first seven weeks of the semester. Foundations of Education has the two-hour time period during the second half of the semester. Because the courses are open to all students who want to explore education as a major, no limit is placed on the enrollment. There are often 50 – 60 students in the class.

Before the Foundations course began in October of 1998, I randomly assigned students to groups, which would be their permanent group for the entire course. I tried to put juniors and seniors into groups with sophomores (assuming that juniors and seniors would add a modest level of maturity). I created a tent card for each student and placed four tent cards on each table with a group number. When students entered class the first day, they could find their place and their group assignment. By placing these cards on

the table before each class. I could easily take roll (removing the cards of absent students) and could call students by name during large group discussions.

On the first day of class, students discussed in their small groups and then all together as an entire class things that make a group work well and those that cause a group to be dysfunctional. Each group made a list of group rules and consequences for not following the rules.

Students were given a list of group roles. They were instructed to assume a different role for each problem and to reflect on their role in their journals.

Students sat with their groups each class period. On some days, a problem was introduced to the entire class. Time was provided for small group and then whole-class discussion. Many days were given to the group for group work. Students were required to come to class every day where roll was taken and questions were addressed. Then they were allowed to work in their groups for the two hours. Other days were used for group presentations and/or whole-class discussions. Presentations included lectures, panel discussions, and role-plays.

Problems Explored by Students

The problems for the course were based on two fictional first-year teachers, Sarah and John. The problems attempted to explore issues that a typical first-year teacher would face. One dealt with standardized test scores printed in the local newspaper. Others dealt with issues of diversity, inclusion, school funding, and other basic contemporary educational issues.

Findings

University –Wide

Initial university-wide results were analyzed for courses for which there was a PBL and a non-PBL section of the same course. Findings were interesting. On the Student Attitudes and Activities Assessment, there were few significant differences between the responses from students in PBL courses and those in non-PBL courses, either at the beginning or the ending of the semester. End of course surveys showed that students in PBL courses rated significantly lower than their non-PBL counterparts the items "I enjoy writing multiple drafts of papers" and "I enjoy making formal presentations." Students in both PBL and non-PBL sections rated almost all items lower at the end of the semester than at the beginning.

Below is a table showing students' responses on the End of Course Evaluations with comparisons between students who were in PBL sections and non-PBL sections of the same courses.

End of Course Evaluations
Fall 1998

1-Strongly Disagree, 2-Disagree, 3-No Opinion, 4-Agree, 5-Strongly Agree

Item	PBL Course	Non-PBL Course
This course increased my ability to solve real-world problems.	3.43	3.27
This course encouraged me to consider alternatives when solving problems.	3.65	3.37
This course increased my ability to work effectively on a team.	3.80	3.44
This course encouraged me to take an active role in my learning.	3.85	
I have used knowledge and methods drawn from outside this course to complete my course assignments.	3.88	3.79
This course improved my ability to identify appropriate resources.	3.73	3.72

On the End of Course Evaluation, students in PBL courses rated all items higher than did those in non-PBL sections. In particular, students reported more confidence in considering alternatives when solving problems and in their ability to work on teams.

Course-Specific Data

Data from Foundations of Education was not included in the analysis above because there was no non-PBL section of the course. Assessment data from this course is primarily qualitative, reported in students' journals and course evaluations. Students were asked to reflect on what went well for them in the course and were asked to make suggestions for improvement.

Student Performance

In general, students' work was satisfactory but superficial. Little of the written work was exemplary. I believe that I must approach students differently and provide basic information in order to challenge them to go beyond the surface. This is one professional goal for future classes, challenging students to produce more thoughtful written and oral work.

Student Evaluation of the Class

The difficulties of using PBL strategies effectively in a large class were reflected in student evaluations. Because they did not have the skills to take their groups beyond the surface, many viewed the class as superficial. They felt that lecture would have provided them with more information. They also felt that they were asked to do the same thing over and over. Large numbers of groups with no tutors failed to increase problem-solving skills.

Faculty Experience

The experience with this course was frustrating and disappointing, yet invigorating. I recognized many of the concerns as the weeks progressed. I was able to address some, and students reacted positively. Others I was not able to address, but I reflected on them constantly and planned ways to improve in the future. Recognizing that class presentations from 14 groups became tedious, I made changes in the way that students reported out on the last two problems. Instead of group presentations to the class, we had small then large group discussions. Most of the students participated and seemed to enjoy these discussions. Because I could not meet with each group, I gave them questions to focus their inquiry. This made them more comfortable, but took away some of their independence in the learning process.

I believe strongly that PBL strategies can challenge students' thinking and problem-solving skills. My task is to make PBL work effectively in a large class. I must find a balance in teaching strategies to reach all students' learning styles, while challenging them to stretch. I have outlined proposed changes in later sections.

Conclusions and Implications

Following is a reflective summary of significant conclusions drawn from the students' comments as well as from my own journal.

Working in Groups

Things that went well

The beginning of the course worked very well. The tent cards were a very efficient way to put a large number of students into groups—eliminating the chaos of reshuffling.

Some of the student presentations went very well. Students learned from each other some important information and ways to present effectively. One student wrote in his journal, "Our group learned that there are better ways of presenting than just standing up and talking to the class. We'll do better on our next presentation." (And they did.)

Student evaluations of themselves and of their groups worked well. Students felt that they had a forum to express dissatisfaction with members who did not carry their weight and compliment those who contributed to the group effort. Everyone knew that they would be held accountable.

Things that did not go well

Placing students into groups and expecting them to discover all information without the help of a designated tutor does not work well. Students spend their time discovering the information on the surface. Without someone to question, challenge, and encourage them, they never get below the surface. Consequently, they view the course as superficial-- less challenging and less meaningful.

Helping students develop and use problem-solving skills was not very successful in a class of 56 students.

Group presentations by 14 groups on the same topic (even if each presentation is short) become redundant and boring.

External evaluation of group processes for 14 groups is a worthy goal but, in reality, is impossible for a single person.

Assuring that groups will rotate group roles is difficult, if not impossible, without group facilitators.

When students view material as redundant and boring they also miss the real world relevance.

Methods and Strategies

Things that went well

The first short problem, a quick investigation of PBL, went well. Students had specific questions to answer and resources to use. The whole-group discussion was very productive. As I look back, I see these two points as key—focusing the students and availability of resources. Large group discussions preceded by individual and small group focus on a topic were effective and often lively.

Revisiting throughout the semester information gathered and shared about learning theories and philosophers helped students retain and rethink the information.

Things that did not go well

Students, in general, are much more comfortable with lecture. This has become their dominant learning style. For some, this is because they have been forced, through the years, to become successful through this delivery mode. For the more analytical learners, this is the more comfortable delivery mode because it is the most efficient. I am convinced that completely abandoning lecture is not only unnecessary, but also unfair to students for whom this strategy truly complements their personal learning style.

Just as all-lecture can become boring, any learning strategy can become so. If variety is the spice of life, it is also the catalyst that encourages learning to expand and flourish.

Content / Problems

Things that went well

I believe that students understand the relevance of historical and philosophical perspectives on education better than they have in the past. I believe that much of what was discussed will be retained.

Things that did not go well

Students at this level find it hard to see the relevance of most of these issues. The problems need to be better connected to real schools.

Recommendations

I have listed below suggestions for changes to more effectively reach the goals of the course.

With a large class, I believe that the teacher must provide a certain level of content, enough to give students a base upon which to work and a focus for their research. This may be accomplished with lecture, mini-lecture, or another mode of delivery of information. Students can then be challenged to probe beneath the surface to gain more depth.

Problems need to be very engaging—providing a reason for students to want to gain the information.

Students at this level need a structure to connect problems to the real world. Working with an administrator at a local K-12 school might help students make better connections. Students could discuss their issues with the administrators and present to them their proposed solutions before bringing them back to class.

For undergraduates, there must be a variety of activities—in course delivery and in ways to present findings.

Clear rubrics should be developed for evaluation of oral projects. Each class member would assess all projects using the rubrics.

Some specific class time should be set aside for the professor to meet with individual groups to facilitate their understanding of the problem and their progress.

Implications for further study

This study was just the beginning of an on-going study of the use of problem-based learning in an undergraduate teacher education course. Changes must be made in the course and research continue to determine if PBL is, over time, to be successful in stimulating students' learning and in changing their attitudes about the learning process. As PBL is implemented in more teacher education classes at Samford, studies must be replicated and results compared.

Issues remain to be investigated in an effort to determine ways to use PBL strategies effectively in a large class. Questions to be addressed include the following: How can problems be written to truly engage students? How can the teacher facilitate a large group discussion so students become engaged in and focused on the important issues? How can students be encouraged to dig beneath the surface to investigate the depth of information? How can problem-solving skills be developed?

The Second Time Around

After reading the students' comments and talking with them individually and in small groups, I made many changes in the structure of the course before teaching it again.

In this section, I will discuss changes made in the course during spring semester and the results.

Content/Problems

While the course objectives did not change, I rewrote all of the problems. Problems were shorter and more to the point. In order to help students to understand the relevance of each issue to their lives and their chosen profession, I included recent articles from the local newspaper relating to the problem.

Students dealt with the issue of equity in funding for education through problems that culminated in debates on the lottery and on educational vouchers. One problem asked students to examine the question of whether teaching is accepted as a profession and if not, what teachers could do to make a difference. Other problems posed classroom issues of working with children from diverse cultures and inclusion of children with special needs. Each of these was presented to the students with news articles and/or editorials to help them focus on the varied public perspectives.

One problem examined the issue of the most appropriate curricular structure to encourage learning. In presenting the problem, I passed around a front page article that gave the "report card" scores of each school in the metropolitan area. A part of the problem was a simulated memo from the "superintendent" stating that job security was assured by high test scores. During the week that the students were working on the problem, the local news came through as if on cue. The front page reported that a local system failed to rehire 45 teachers and reassigned three principals, because of the failure of the schools to improve their scores on standardized tests. Point made.

Methods and Strategies

I made many changes in the structure of the course and in the strategies used. On the first day of class, I had the students take a learning style inventory to determine their preferred style. We then talked about characteristics of each style, what it meant to have a particular preference, and the implications for teachers with diverse styles in their classes. I then assured the class that I would try to use a variety of strategies so that I would meet each student's comfort level some of the time and attempt to stretch everyone much of the time.

I included two lectures with quizzes. The first lecture focused on the historical roots of education; the second dealt with philosophical foundations. These were designed to provide basic information as background to the problems and as preparation for the formal exit exam students will take prior to graduation. The lecture/quiz format served this purpose as well as providing a comfort level for the analytical, information-processing students and for the students who wanted more control over their own grade, who were uncomfortable with their entire grade being dependent upon the work of a group.

I gave each group a different problem rather than having all students work on the same one. I met with each group twice for 30 minutes to listen, probe and guide, to try to ensure that they were on track. Their challenge was to research, write a paper, and make a creative presentation to the class that would help their peers understand the issues. I then gave them three class meetings to work with their groups.

To encourage students to recognize the problems as a part of the real world of education, I arranged for each group to be mentored by an administrator in a local school. Students went to the school, interviewed the administrator, talked to teachers, and observed classes. Students were enthusiastic about this aspect of the process.

Because each group had a different problem, the presentations were fresh and interesting to the class. They did not become redundant and boring. Also, presenters recognized that they had a responsibility the rest of the class—to teach something about which they had become the experts. And they felt challenged to do so in an interesting way.

Working in Groups

I used the results of the learning style inventory to place students into heterogeneous groups. I provided class time for their work and walked around to listen and answer questions when appropriate. Eight of the nine groups worked exceptionally well together, many reporting that this was the best group they had ever been a part of. I think that including different styles in each group may have had some significance. More importantly, however, I think the students felt challenged by the problems and by each other. I think that having sufficient time to meet together in class eliminated the stress of trying to fit together many busy schedules and, thus, the frustration and negative feelings often associated with traditional "group work." Focusing on two major problems instead of many small ones provided time for students to probe more deeply and become more engaged. Comments from students' portfolios reflect these conclusions.

Findings

Although there is no quantitative data from the spring course other than the traditional course evaluation (which demonstrated significantly higher student satisfaction), professor's observations and formal and informal comments by students confirmed that students felt challenged and successful during the spring course. Following are typical comments from students' reflective portfolios.

"The first thing I honestly learned was to not give up when faced with a tough problem. We thought for a fact that we would have absolutely no substantial arguments the day of the debate. But through persistence we pulled ourselves through ..

"It was definitely beneficial to have all five of us working on the same problem in order to come to a solid conclusion. Had I been working on this project by myself, my outcome would have been quite different."

"I am now ready to fight this [negative] public image. I realized that changing this starts with me. I am ready to involve myself with the professional organizations and get ideas going."

" [The principal at a local school] was a very helpful resource to use in solving the problem. She gave us real life, true examples of diversity and how she dealt with it."

"I learned the importance of putting 110% into my first year of teaching."

"I'll admit that at first, I was frightened of a PBL course structure. I really never had been a part of one but had heard horror stories. After actually getting into my group, I realized that it would be fun to work on something that directly relates to my chosen career."

"I have taken other PBL classes which were redundant and boring, but because every group addressed a different problem, it made the class more interesting."

"I liked how they [the group projects] were balanced with student evaluations as well as tests taken individually. That way, I felt like I was earning my own grade, and it was not dependent upon someone else in the group."

"I enjoyed this class because of the interesting subject matter that we were presented with. I felt a connection with the material and realized that it was not just a grade, but that it was affecting me as a person. I cannot say that about many of the classes I have taken until now. This made me feel excited because it confirmed that teaching was my passion."

Conclusions and Implications

I believe that the spring semester demonstrated that PBL can be used effectively with a large class of undergraduate students to make information come alive and have meaning beyond the textbook. To help transition undergraduates who are primarily coming from a traditional teacher-centered background, professors need to use a variety

of strategies. Professors need to be clear with students about the kind of strategies they are using and why they feel this is important. Students' diverse learning styles must be addressed, and students must feel that they have responsibility for their own grade.

To help students to become engaged in the material, problems must be designed so that students connect with the scenarios in a personal way. They must see the problems as a part of their real world.

Finally, to help students probe more deeply, professors must provide some background material. Also, they must design in time to meet with each group individually to question, probe, and guide. This provides a level of comfort for students as well as helping them to ask questions they might have overlooked.

Recommendations

I believe that professors must continue to use problem-based learning and other active learning strategies in their classes. At the same time we must communicate with our students and with each other. Feedback from students along with ideas and results shared by colleagues should help refine our PBL courses each term. In so doing, schools of education can work collaboratively to address the questions posed by the use of PBL in the classroom and the broader issues of preparing the best teachers for the future.

References

Applebee, A. N., Langer, J. A., & Mullis, I. V. (1991). Crossroads in American education: A summary of findings from the nation's report card. In A. Costa (Ed.), *Developing minds: A resource book for teaching thinking* (pp. 17-18). Alexandria, VA: Association for Supervision and Curriculum Development.

Boyer, E. L. (1995). The educated person. In J. A. Beane (Ed.), *Toward a coherent curriculum* (pp. 16-25). Alexandria, VA: Association for Supervision and Curriculum Development.

Caine, R. N., & Caine, G. (1995). Reinventing schools through brain-based learning. *Educational Leadership, 52*(7), 43-47.

Cohen, M. (1978). Whatever happened to interdisciplinary education? *Educational Leadership, 36*(2), 122-126.

Cummings, R. J. (1989). The interdisciplinary challenge: Connection and balance. *National Forum: Phi Kappa Phi Journal, 69*(2), 2-3.

Edmundson, P. J. (1990). A normative look at the curriculum in teacher education. *Phi Delta Kappan, 71*, 717-722.

Goodlad, J. I. (1984). *A place called school: Prospects for the future*. New York: McGraw-Hill.

Hergenhahn, B. R. (1982). *An introduction to theories of learning* (2nd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Lowery, L. F. (1991). The biological basis for thinking. In A. Costa (Ed.), *Developing minds: A resource book for teaching thinking* (pp. 108-117). Alexandria, VA: Association for Supervision and Curriculum Development.

McTighe, J., & Schollenberger, J. (1991). Why teach thinking? A statement of rationale. In A. Costa (Ed.), *Developing minds: A resource book for teaching thinking*. Alexandria, VA: Association for Supervision and Curriculum Development.

Penick, J. E. (1989). Issues-based education: A need and a rationale. *Education and Urban Society, 22*(1), 3-8.

Relan, A., & Kimpston, R. (1991). *Curriculum integration: A critical analysis of practical and conceptual issues.* Annual Convention of the American Educational Research Association. (ERIC Document Reproduction Service No. ED 334 677)

Sarason, S. (1993). *The case for change.* San Francisco: Jossey-Bass.

Sylwester, R. (1995). *A celebration of neurons: An educator's guide to the human brain.* Alexandria, VA: Association for Supervision and Curriculum Development.

Wilson, C. E. A. (1991). *A vision of a preferred curriculum for the 21st century: Action research in school administration* (Report No. EA-023-447). Annual Meeting of the Association for Supervision and Curriculum Development, Rochester, MI: Oakland University. (ERIC Document Reproduction Service No. ED 344 275)